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J. H. C.

DEC 18 1963

December 12, 1963

AIR MAIL

Mr. R. B. Meen, Superintendent
Mission Unit
American Smelting and Refining Company
P. O. Box 111
Sahuarita, Arizona 85629

MISSION UNIT
GRINDING SAMPLES FOR GRINDING TESTS

Dear Sir:

This will acknowledge receipt of your letter of December 5th which I also discussed with you, Mr. Vincent and others while I was in Tucson recently.

Your letter covers what I had in mind unless Mr. Courtright is able to find further descriptions of actual core drill samples taken so that we can locate on the ore reserve sections just where the individual samples actually came from.

As I explained to you, what I have in mind is to leave in the files here as complete a record as possible to substantiate that quite complete grinding tests were made on the different types of ore, particularly the argillite ore from the actual Mission ore reserve ore. This has now been done and I feel that besides the grinding tests made on the samples of similar ore from the Pima Mine check tests were also made on actual drill ore results from the Mission ore itself. All of the grinding tests made were very consistent and demonstrated that the argillite is about twice as hard to grind as the tactite. Whether or not this will prove always to be the case within the degree of grinding actually required on the ore as produced remains to be seen, but regardless of this quite thorough and complete tests were made before the mill was designed. Admittedly, there are a number of factors such as down time and the fact that we got over-sized rod mills because they were cheaper, which naturally also affect the mill capacity at various times.

Very truly yours,

D. J. Pope

DJP:pf
cc: KHRichard-w/att.
TASnedden-A/M
NWeiss -A/M
JDVincent-A/M
JHCourtright-A/M - w/att.

AMERICAN SMELTING AND REFINING COMPANY
Sahuarita Arizona

December 5, 1963

Mr. D. J. Pope, Asst. to Vice President
American Smelting and Refining Company
120 Broadway
New York, New York 10005

MISSION UNIT
Mission Samples for
Grinding Tests

Dear Sir:

In reply to your note of November 30 and your letter of November 26, a thorough review of all letters and correspondence regarding these tests has been made by Mr. Vincent.

Mr. Vincent's letters of September 8, 1958 to Allis Chalmers, Marcy Mill Division of Mine and Smelter Company, Dorr-Oliver Company and El Paso Testing Laboratory were written to outline the work to be done by them on Mission ore samples of Tactite, Hornfels and Argillite ore. At the time these letters were written, the exact samples had not been chosen.

Mr. T. A. Snedden's letter on September 30, 1958 to the above groups stated the identity of the actual samples sent. They were:

CRUSHING

100 lbs. Tactite (2"-4") Pilot Mill Test Lots 1--6
100 lbs. Hornfels (2"-4") Pilot Mill Test Lots 8
100 lbs. Pima Argillite (2"-4") Pilot Mill Test Lots 11 & 12

GRINDING

100 lbs. Tactite, Mine Run Pilot Mill Test Lot 1
100 lbs. Hornfels, Mine Run Pilot Mill Test Lot 8
100 lbs. Pima Argillite, Mine Run Pilot Mill Test Lots 11 & 12

The Pilot Mill Test lots were fully described in Mr. A. B. Romney's Milling Test Report, July 7 -- October 8, 1958. The description was given to Mr. Romney by Mr. John Kinnison of the Geology Department, who examined the ore in the face of the Mission underground working and on the stockpiles.

As for the Pima Argillite, this ore was picked out by Mr. Kenyon Richard and Mr. John Kinnison, since none was available from the exploration shaft. Mr. Richard comments on this sample to Mr. T. A. Snedden in his letter of December 26, 1958 and suggests the possibility of supplying a composite sample of diamond drill rejects of argillite ore.

The Test lots sent Allis Chalmers, El Paso Testing Laboratory, et al were prepared by Mr. A. B. Romney who was in direct charge of the Pilot Plant Tests.

The test reports on these samples correspond to Allis Chalmers 07111558

which was corrected and called 4137, and El Paso Serial Report 685-B.

The second group of samples sent to Allis Chalmers were also composed of Pilot Plant lots. These tests were requested by Mr. Norman Weiss in a letter to Mr. T. A. Snedden, December 16, 1958. Mr. T. A. Snedden in his letter of transmittal of January 7, 1958 lists the samples as follows:

100 lbs. Tactite Ore -- Test Mill Runs Lots 1 -- 4
100 lbs. Hornfels Ore -- Test Mill Runs Lots 7, 8 and 10
100 lbs. Argillite Ore (Pima), Test Mill Runs Lots 11 and 12

The Allis Chalmers Report No. 4214 reports on these samples. Report No. 4214-B was a separate report on a Tactite ore sample that had been requested by Allis Chalmers to finish their work. The sample was found to be identical to the one of Lots 1--4, Tactite ore transmitted by Mr. Snedden's letter of January 7, 1958.

Presumably these samples were prepared by Mr. Romney or Mr. Kinnison as the samples were stored at the Core Laboratory.

On December 29, 1958, Mr. T. A. Snedden wrote to Norman Weiss and enclosed a copy of Mr. Kenyon Richard's memorandum of December 26, 1958 on the subject of Argillite grinding tests and the possibility of getting a composite sample of Mission Argillite diamond drill core rejects as an additional test. This was agreed upon, and Mr. A. C. Hall, in his letter of January 20, 1958, transmitted 100 lbs. of an Argillite composite of diamond drill core rejects to Allis Chalmers who reported on this sample in their report No. 4245.

Presumably Mr. John Kinnison who was in charge of the Core Laboratory at Mission prepared this sample. Mr. Hall's letter states that the sample should be representative.

The Work Index of the Silver Bell February 1957 composite was calculated to be 12.94 by Mr. Ray Troxell based on El Paso Test 647 data and corrected for size distribution.

Very truly yours,

R. B. MEEN
Superintendent

JDV:bmk
attachs

cc: TASnedden, wo/attach
NWeiss, "
JDVincent, "

Copied NYO-MD-12/12 [illegible] for: KRichard
JLCourtright-A/M

J. H. COURTRIGHT

J. H. C.
DEC - 2 1963

November 26, 1963

AIR MAIL - CONFIDENTIAL

Mr. T. A. Snedden, Manager
Southwestern Mining Department
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

MISSION UNIT
GRINDING INDEXES

Dear Sir:

With reference to our conversation, Mr. Vincent's letter, copy of which I wished to receive, was that to R. J. Mellen of September 8, 1956 which I hope included a description of the samples which were tested and reported on by Serial 685 B of the El Paso Testing Laboratory. I spoke with Mr. Vincent about this by telephone after I found the date of the letter because I thought he might locate it more quickly.

His copy requests Mr. Weiss again to caution the Testing Laboratory that they should always include a full description of the samples in their test reports and if such description is not supplied in the first place then they should ask for it.

Similarly, there is no proper description of the samples in connection with the various grinding tests that Allis-Chalmers made. In his memorandum of December 15, 1958 under "Additional work by Allis-Chalmers," Mr. Weiss states as follows:

> "We have asked Allis Chalmers for the following additional information and test work:
>
> 1. Obtain work indices on new samples of tactite, hornfels and argillite, etc."

Mr. Kenyon Richard in his letter of July 2, 1957 sent composite samples to Mr. Mellen for crushing and grinding tests. These samples are very well described and in the El Paso Ore Testing Laboratory report of Serial 612 G the description of the samples is repeated, as it should be. However, in making the grinding test, everything is

based on a comparison with Silver Bell ore but without explaining very clearly what Silver Bell ore was used or what its grinding characteristics were, but it is merely stated "to compare these with Silver Bell February 1957 composite (Serial 647)." There may well be other letters which clarify what the grinding index of the Silver Bell ore was. In any case the relative resistance to grinding of the Mission siliceous type rock which would correspond to argillite was about 1.44 as compared to about .73 for the tactite and hornfels lots, Silver Bell ore having a relative resistance to grinding of 1.0. I would assume that the grinding index of the Silver Bell ore was around 12 or 13. Therefore, apparently the El Paso tests checked quite well with those made by Allis-Chalmers.

I will be interested in what comparisons and sample descriptions you and the rest come up with. Certainly I do not think that we should discard or discount careful work previously done without an equally careful study with actual tests having been made.

Very truly yours,

D. J. Pope

DJP:pf

cc: KERichard
NWeiss
RBMeen
JDVincent
JHCourtright
} A/M - CONFIDENTIAL

P.S. Since writing the above I have read Allis Chalmers test report No. 4245 of March 12, 1959. The sample is described as - Argillite Ore - Mission Project (crushed core drills shipped 1/21/59). I have not found the letter describing this sample. Neither have I found sample description for A. C. test No. 4214 of 2/19/59. I would like to have these descriptions.

D. J. P.

J. H. C.
NOV 26 1963

November 22, 1963

AIR MAIL - CONFIDENTIAL

Mr. T. A. Snedden, Manager
Southwestern Mining Department
American Smelting and Refining Company
813 Valley National Building
Tucson, Arizona

MISSION UNIT
GRINDING INDEX OF ARGILLITE

Dear Sir:

I have just been shown a copy of Mr. Courtright's memorandum of October 3, 1963 in which he now estimates that the grinding index of 90% of the argillite is going to be much lower than previously estimated. Among other things he indicates that the only grinding test which applied to the Mission ore was based on a test of Pima argillite. He does not say what grinding index 90% of the argillite might have, but indicates that it might be around 12 by inference.

If the conclusions of Mr. Courtright are true, then this represents a very serious mistake in the engineering which led to the mill design, even though this mistake may turn out rather fortunate because of the relationship between copper price and costs and the fact that there is a lot of material which assays less in copper than the original cut-off grade. There is also the fortunate circumstance that high recovery of copper can be made on this low grade material.

We are looking up the history of the samples on which grindability tests were made as far as we have it in the files and also we are making a rough check as to whether or not the pit has extended far enough westward so that there is really a large proportion of the argillitic ore as shown on the original reserves being treated in the mill. You will recall that during the first four years the mill feed was only supposed to average 5% argillite and since we have only been operating two years it is surprising if the mill feed is actually averaging 23% argillite which is almost up to the total expected average for the whole ore body. I have

noted the percent argillite given by Mr. Meen in the monthly reports but have not taken it very seriously. For example, in the September letter it was stated that 56% of October's ore would be argillitic type rock. In October it was stated that 16% of the ore was argillitic type rock but that in November it would be 36%.

If I recall correctly, we had grinding tests made at several locations and this was not always on the same sample, particularly they were not all made on the sample of the Pima mine. The metallurgical characteristics of that type of ore were determined with the sample from the Pima Property in the pilot plant tests made at the University of Arizona. Surely the same sample was not used for all the grindability tests at Allis Chalmers, El Paso and I believe elsewhere.

There is another area where this grinding is important and that is the Banner ore. The geological staff advised us that most of the ore in the Eisenhower group is the hard grinding argillitic type. I tried to arrange for us to take underground samples so that pilot plant tests could be made but some of the Banner people blocked this.

In view of the importance of this grindability index, this is to request that you have the Mission geologists summarize the situation, and with full description of the locations, prepare core samples so that additional grindability tests can be made on various parts of the ore body where argillite type ore occurs. This should be done for both the old ore reserve and for the newly drilled areas around the fringes. If you can obtain sufficient samples some tests should also be made for the Eisenhower area, particularly the upper part of the ore body, and the part which borders on Mission property. In summarizing the situation the geologists should relate the new work back to the set of geological plans and sections which accompanied the ore reserve of March 2, 1959, which was prepared by K. E. Richard and W. O. Schubel.

I do not know where the figures on percentage of argillite given by Mr. Meen originate but he should make sure that these are as correct as possible. Where there is so much variance in what he says the type of ore is and what it should be in accordance with previous information, he should include some explanation. Similarly, the Milling Department should make some comments on this and if the ore did not have the grindability characteristics which were expected, then some explanation should be given.

Lastly, when matters come up which involve the general design and calculationsin connection with a property then those of

us here in New York who are interested should receive copy of these letters, which in this case is the undersigned.

Very truly yours,

D. J. Pope

DJP:pf

cc: KERichard
NWeiss
RBNeen
JDVincent
JHCourtright

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